



UNITED STATES PATENT AND TRADEMARK OFFICE

UNITED STATES DEPARTMENT OF COMMERCE
United States Patent and Trademark Office
Address: COMMISSIONER FOR PATENTS
P.O. Box 1450
Alexandria, Virginia 22313-1450
www.uspto.gov

APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/866,533	05/24/2001	Chad A. Mirkin	4183-1-1	4605
22428	7590	12/01/2003	EXAMINER	
FOLEY AND LARDNER SUITE 500 3000 K STREET NW WASHINGTON, DC 20007			FLETCHER III, WILLIAM P	
			ART UNIT	PAPER NUMBER
			1762	

DATE MAILED: 12/01/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/866,533

Applicant(s)

MIRKIN ET AL.

Examiner

William P. Fletcher III

Art Unit

1762

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 May 2001.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-218 is/are pending in the application.
- 4a) Of the above claim(s) 38-87 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1, 10-15, 17-24, 31-34, 36, 37, 88-123, 133, 134, 136, 137, 139, 140, 143-192 and 201-218 is/are rejected.
- 7) ☒ Claim(s) 2-9, 16, 25-30, 35, 124-132, 135, 138, 141, 142 and 193-201 is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☒ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. §§ 119 and 120

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 13) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application) since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.
a) ☐ The translation of the foreign language provisional application has been received.
- 14) ☒ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121 since a specific reference was included in the first sentence of the specification or in an Application Data Sheet. 37 CFR 1.78.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s) 01/23/02 6) ☐ Other: _____
and 11/15/01

DETAILED ACTION

Election/Restrictions

1. Restriction to one of the following inventions is required under 35 U.S.C. 121:
 - I. Claims 1 – 37 and 88 – 218, drawn to a method of nanolithography, classified in class 427, subclass 256.
 - II. Claim 38, drawn to a patterned substrate, classified in class 428, subclass 420.
 - III. Claims 39 – 67, drawn to a kit for nanolithography and an atomic force microscope (AFM) adapted for nanolithography, classified in class 401, subclass 195.
 - IV. Claims 68 – 72, drawn to a sub-micrometer array, classified in class 206, subclass 558.
 - V. Claims 73 – 78, drawn to a method of performing AFM imaging in air and an AFM tip, classified in class 250, subclass 306.
 - VI. Claims 79 – 86, drawn to an apparatus for depositing a compound on a substrate, classified in class 118, subclass 712.
 - VII. Claim 87, drawn to a method for depositing a compound on a substrate, classified in class 427, subclass 8.

The inventions are distinct, each from the other because of the following reasons:

2. Inventions I and II are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case, the

patterned substrate can be made by another and materially different process: chemical vapor deposition (CVD) utilizing a mask.

3. Inventions I and III are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case, the kit and adapted AFM apparatus can be used to practice another and materially different process: rendering an atomic force micrograph of a substrate.

4. Inventions I and IV, V, and VII are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the different inventions have different modes of operation, different functions, and different effects. Invention I is a method of patterning a substrate while invention IV is a sub-micrometer array and invention V is a method and apparatus for rendering an AFM image in air. Invention I requires a scanning probe microscope tip, while invention VII does not; invention I requires a patterning compound while invention VII does not; and invention I requires that the tip be coated with the patterning compound while invention VII does not.

5. Inventions I and VI are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case, the apparatus as claimed can be used to practice another and materially different process: a process in which the

tip is not a scanning probe microscope tip. Alternatively, the process as claimed can be practiced with by another and materially different apparatus or by hand: an apparatus in which the pattern is not determined by the claimed data collection or in which the pattern is drawn by hand.

6. Inventions II and III are related as apparatus and product made. The inventions in this relationship are distinct if either or both of the following can be shown: (1) that the apparatus as claimed is not an obvious apparatus for making the product and the apparatus can be used for making a different product or (2) that the product as claimed can be made by another and materially different apparatus (MPEP § 806.05(g)). In this case, the product as claimed can be made by another and materially different apparatus: a CVD apparatus utilizing a mask.

7. Inventions II, IV, and V are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the different inventions case the different inventions have different modes of operation, different functions, and different effects. Invention II is a patterned substrate while invention IV is a sub-micrometer array and invention V is a method and apparatus for rendering an AFM image in air.

8. Inventions II and VI are related as apparatus and product made. The inventions in this relationship are distinct if either or both of the following can be shown: (1) that the apparatus as claimed is not an obvious apparatus for making the product and the apparatus can be used for making a different product or (2) that the product as claimed can be made by another and materially different apparatus (MPEP § 806.05(g)). In this case, the product as claimed can be practiced with by another and materially different apparatus or by hand: an apparatus in which

the pattern is not determined by the claimed data collection or in which the pattern is drawn by hand. Alternatively, the product can be made by a CVD apparatus utilizing a mask.

9. Inventions II and VII are related as process of making and product made. The inventions are distinct if either or both of the following can be shown: (1) that the process as claimed can be used to make other and materially different product or (2) that the product as claimed can be made by another and materially different process (MPEP § 806.05(f)). In the instant case, the product can be made by another and materially different process: a CVD process utilizing a mask. Alternatively, the product can be made by a process in which the pattern is not determined by the claimed data collection or in which the pattern is drawn by hand.

10. Inventions III and IV, V, VI, and VIII are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the different inventions have different modes of operation, different functions, and different effects: invention III is a nanolithography kit and an adapted AFM apparatus while invention IV is a sub-micrometer array, invention V is a method and tip for performing AFM imaging in air, invention VI is an apparatus for depositing a compound on a substrate, and invention VII is a method for depositing a compound on a substrate.

11. Inventions IV and V, VI, and VII are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the different inventions have different modes of operation, different functions, and different effects: invention IV is a sub-micrometer array while invention V is a method and tip

Art Unit: 1762

for performing AFM imaging in air, invention VI is an apparatus for depositing a compound on a substrate, and invention VII is a method for depositing a compound on a substrate.

12. Inventions V and VI and VII are unrelated. Inventions are unrelated if it can be shown that they are not disclosed as capable of use together and they have different modes of operation, different functions, or different effects (MPEP § 806.04, MPEP § 808.01). In the instant case the different inventions have different modes of operation, different functions, and different effects: invention V is a method and tip for performing AFM imaging in air while invention VI is an apparatus for depositing a compound on a substrate and invention VII is a method for depositing a compound on a substrate.

13. Inventions VI and VII are related as process and apparatus for its practice. The inventions are distinct if it can be shown that either: (1) the process as claimed can be practiced by another materially different apparatus or by hand, or (2) the apparatus as claimed can be used to practice another and materially different process. (MPEP § 806.05(e)). In this case, the apparatus can be used to practice another and materially different process: a process in which more than one geometric identity is collected and drawn.

14. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art as shown by their different classification, restriction for examination purposes as indicated is proper.

15. Because these inventions are distinct for the reasons given above and the search required for Group III is not required for Group IV, for example, restriction for examination purposes as indicated is proper.

Art Unit: 1762

16. Because these inventions are distinct for the reasons given above and have acquired a separate status in the art because of their recognized divergent subject matter, restriction for examination purposes as indicated is proper.

17. During a telephone conversation with J. Steven Rutt (Reg. No. 40,153) on 23 July 2002 a provisional election was made *with* traverse to prosecute the invention of invention I, claims 1 -- 37 and 88 -- 218. Affirmation of this election must be made by applicant in replying to this Office action. Claims 38 -- 87 are withdrawn from further consideration by the examiner, 37 CFR 1.142(b), as being drawn to a non-elected invention.

Drawings

18. The drawings are objected to because Figs. 13 -- 22 are not sufficiently dark and well-defined. These drawings will not reproduce well. The examiner requests that better copies of these figures be submitted to ensure clear and faithful reproduction in any patent issuing from this application. A proposed drawing correction or corrected drawings are required in reply to the Office action to avoid abandonment of the application. The objection to the drawings will not be held in abeyance.

Specification

19. The disclosure is objected to because of the following informalities: The cross-reference to related applications should be updated to reflect that 09/477,997 issued as U.S. Patent No. 6,635,311 B1.

Appropriate correction is required.

Claim Rejections - 35 USC § 112

20. The following is a quotation of the second paragraph of 35 U.S.C. 112:

Art Unit: 1762

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

21. Claim 216 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

This preamble of this claim recites "A...method...which does not rely on...complicated processing methods, or sophisticated non-commercial instruments...". The terms "complicated" and "sophisticated" are open to subjective interpretation by one of ordinary skill in the art and, consequently, render this claim indefinite. What one practitioner considers complicated and sophisticated can be just the opposite to another practitioner. The specification has not provided a standard by which methods and instruments may be evaluated to determine their degree of complexity and sophistication. Consequently, one of ordinary skill in the art would not be reasonably apprised of the metes and bounds of the claimed subject matter.

Claim Rejections - 35 USC § 102

22. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

23. **Claims 1, 10 – 12, 31 – 34, 36, 37, 88, 89, 91 – 93, 97 – 100, 102, 109 – 112, 115 – 123, 133, 134, 139, 140, 153, 154, 157, 158, 160 – 162, 166 – 169, 171, 178 – 181, 183 – 192, 202 – 205, 211, 212, 216, and 218 are rejected under 35 U.S.C. 102(b) as being anticipated by Jaschke et al. (*Langmuir* 1995, 11, 1061 – 1064).**

With respect to independent claim 1, Jaschke teaches a method in which a scanning force microscope tip is coated with a patterning compound and the coated tip is used to apply the compound to a substrate to produce a desired pattern [p. 1061, cc. 1 – 2].

With respect to independent claim 88, it is well-known that the terms “scanning force microscope” (SFM) and “atomic force microscope” (AFM) are synonymous. Consequently, in teaching an SFM tip, Jaschke is teaching an AFM tip. Further, it is well-known that mica is a solid. Consequently, Jaschke’s teaching of a mica substrate anticipates applicant’s claimed “solid substrate.” Lastly, Jaschke teaches that the patterns are stable [p. 1061, c. 2, penultimate ¶].

With respect to independent claim 157, applicant has defined “ink,” within the context of this claim, as referring to the patterning compound (see the bottom of p. 3 of the specification). Consequently, Jaschke’s patterning compound anticipates applicant’s claimed ink. Further, Jaschke teaches nano-scale structures [p. 1061, c. 2, l. 5; pp. 1061 – 1062, bridging ¶; Fig. 2; and p. 1062, c. 2, ¶s 1 – 2].

With respect to independent claims 216 and 218, Jaschke’s method does not rely on a resist or a stamp. Additionally, the processing method involves no more skill than that involved in SFM imaging and the processing equipment includes commercially available SFM imaging cantilevers and tips [p. 1061, c. 1, ¶ 2]. Further, regarding the transitional phrase “consisting essentially of”:

- ❖ The transitional phrase “consisting essentially of” limits the scope of a claim to the specified materials or steps “and those that do not *materially* affect the *basic* and *novel* characteristic(s)” of the claimed invention. *In re Herz*, 537 F.2d 549, 551-52, 190 USPQ 461, 463 (CCPA 1976) (emphasis in original).
- ❖ “A ‘consisting essentially of’ claim occupies a middle ground between closed claims that are written in a ‘consisting of’ format and fully open claims that are drafted in a

comprising' format." *PPG Industries v. Guardian Industries*, 156 F.3d 1351, 1354, 48 USPQ2d 1351, 1353-54 (Fed. Cir. 1998). See also *Atlas Powder v. E.I. duPont de Nemours & Co.*, 750 F.2d 1569, 224 USPQ 409 (Fed. Cir. 1984); *In re Janakirama-Rao*, 317 F.2d 951, 137 USPQ 893 (CCPA 1963); *Water Technologies Corp. vs. Calco, Ltd.*, 850 F.2d 660, 7 USPQ2d 1097 (Fed. Cir. 1988).

- ❖ For the purposes of searching for and applying prior art under 35 U.S.C. 102 and 103, absent a clear indication in the specification or claims of what the basic and novel characteristics actually are, "consisting essentially of" will be construed as equivalent to "comprising." See, e.g., *PPG*, 156 F.3d at 1355, 48 USPQ2d at 1355.
- ❖ If an applicant contends that additional steps or materials in the prior art are excluded by the recitation of "consisting essentially of," applicant has the burden of showing that the introduction of additional steps or components would materially change the characteristics of applicant's invention. *In re De Lajarte*, 337 F.2d 870, 143 USPQ 256 (CCPA 1964). See also *Ex parte Hoffman*, 12 USPQ2d 1061, 1063-64 (Bd. Pat. App. & Inter. 1989).

It is the examiner's position that applicant has not indicated what, if any, basic and novel characteristics of the claimed invention would be materially affected by the method of Jaschke. As noted above, if applicant contends that additional steps in Jaschke are excluded by the recitation of "consisting essentially of," *applicant has the burden* of showing that the introduction of additional steps would materially change the characteristics of applicant's invention. Lastly, since the patterning compound forms a stable structure on the surface of the substrate, it is the examiner's position that Jaschke anticipates applicant's claimed patterning compound having a "chemical affinity for the solid substrate."

With respect to dependent claims 10, 133, 134, 202, and 203, Jaschke teaches that coating the tip with the patterning compound by contacting the tip with a solution of the patterning compound one time [p. 1061, c. 1, ¶ 2].

With respect to dependent claim 11, it is clear, from the discussion of the impact of the solvent for the patterning compound on the deposition, that Jaschke performed patterning after the tip had been allowed to dry [p. 1062, c. 2, last ¶ – p. 1064, c. 1, top].

With respect to dependent claim 12, insofar as Jaschke discloses contacting the tip with the patterning compound only once and patterning with a wet or dry tip, it is the examiner's position that Jaschke anticipates this claim as well.

With respect to dependent claims 31 – 34, 102, 154, 171, 183, 184, and 212, Jaschke teaches deposition of an array of nano-scale dots of chemical molecules [p. 1061, c. 2, l. 5 and Figs. 2 and 3]. Absent evidence to the contrary, it is the examiner's position that these nano-scale dots anticipate applicant's "nanoparticles" recited in claim 34.

With respect to dependent claims 37, 204, and 205, as noted above, Jaschke teaches an SFM tip, which is synonymous with an AFM tip.

With respect to dependent claims 89 and 158, as noted above, Jaschke teaches the formation of stable nano-scale patterns on the substrate [p. 1061, c. 2, l. 5 and Figs. 2 and 3]. Consequently, it is the examiner's position that the conditions under which the deposition takes place are, inherently, "conditions which provide stable patterns with nanolithographic resolution."

With respect to dependent claims 91 – 93, 112, 160 – 162, 181 Jaschke teaches: "To start the deposition, it was sometimes helpful to bring the tip several times into contact with the surface and withdraw it" [p. 1061, c. 2, ll. 9 – 12]. Jaschke further teaches: "After the tip was loaded with [the patterning compound], it was brought into contact with [the substrate] and used to scan as usual" [p. 1061, cc. 1 – 2, bridging ¶]. It is well-known that conventional SFM scanning involves raster-scanning the tip on the substrate surface. This scanning is repeated [p. 1061, c. 2]. Consequently, Jaschke anticipates these claims.

With respect to dependent claims 36, 97 – 100, 115, and 166 – 169, Jaschke teaches that the pattern is a dot having a diameter of $400\text{ nm} = 0.4\text{ microns} < 1\text{ micron}$ [p. 1061, c. 2, l. 5].

With respect to claims 109 – 111, 178 – 179, Jaschke teaches that the pattern comprises a monolayer and that the patterning compound is known to form a self-assembled monolayer (SAM) on the substrate taught by Jaschke [p. 1062, c. 2, ¶ 1; p. 1064; c. 1, ll. 16 – 19; and p. 1064, c. 2, ll. 6 – 9]. Further, it is the examiner's position that a lattice parameter is a physical property inherently possessed by the pattern of Jaschke.

With respect to dependent claims 116, 117, 153, 185, 186, and 211, insofar as the patterning compound is adhered to a high-energy surface and is not easily removed (for example, by repeated scanning) it is the examiner's position that, absent evidence to the contrary, Jaschke teaches a patterning compound that has a chemical affinity for, and is chemisorbed on, the substrate.

With respect to dependent claims 118 and 187, insofar as solvents such as hexane and ethanol are used to dissolve the patterning compound [p. 1061, c. 1, ¶ 2 and p. 1062, bridging ¶], it is the examiner's position that the patterning compound is not capable of dissolving in water and, consequently, is hydrophobic.

With respect to dependent claims 119 – 123 and 188 – 192, Jaschke teaches that the patterning compound comprises molecules and that the patterning compound may be the claimed sulfur-containing, thiol compounds [p. 1062, c. 2, ¶ 2].

With respect to dependent claims 139 and 140, insofar as the patterning compound of Jaschke introduces functional groups to the surface of the substrate and insofar as nano-scale patterns are produced, Jaschke anticipates these claims.

24. **Claims 1, 31 – 34, 37, 88 – 97, 101, 103 – 108, 112, 113, 116, 117, 119, 143, 145, 148, 157 – 166, 170, 172 – 177, 181, 182, 185, 186, 188, 205, 206, 211, 212, and 215 – 218 are rejected under 35 U.S.C. 102(b) as being anticipated by Mirkin et al. (*Langmuir* 1997, 13, 6864 – 6868).**

With respect to independent claim 1, Mirkin teaches a method in which an AFM tip, having a water coating thereon, is used to apply the water to the surface of a substrate in a desired pattern [abstract and p. 6867, c. 1].

With respect to independent claim 88, since applicant has not provided a specific definition of the term “stable” with respect to the claims, and insofar as the pattern of water remains on the surface of the substrate — at least long enough for micrographs of the coated pattern to be produced — it is the examiner’s position that this pattern is stable. Further, it is well-known that mica is a solid. Consequently, Mirkin’s teaching of a mica substrate [p. 6867, c. 1] anticipates applicant’s claimed “solid substrate.”

With respect to independent claim 157, Mirkin teaches pattern sizes on the order of a few microns (i.e., a few thousand nanometers) [Figures]. Since applicant has not provided a specific definition of the term “nanostructure” with respect to the claims, absent evidence to the contrary, it is the examiner’s position that a pattern size on the order of a few thousand nanometers anticipates a “nanostructure.”

With respect to claim 215, Mirkin teaches that the water is transported to the substrate by capillary transport [p. 6866, c. 1, penultimate ¶; p. 6867, c. 1, last ¶ and c. 2, ll. 9 – 12]. Mirkin also teaches that the surface may be hydrophilic [p. 6867, c. 1]. Since a hydrophilic surface

Art Unit: 1762

inherently has an affinity for water, it is the examiner's position that Mirkin anticipates the molecule's of the patterning compound having "a chemical affinity for the solid substrate."

With respect to independent claims 216 and 218, Mirkin's method does not rely on a resist or a stamp. Additionally, the processing method involves no more skill than that involved in AFM imaging and the processing equipment includes commercially available AFM imaging equipment [p. 6864]. It is the examiner's position that applicant has not indicated what, if any, basic and novel characteristics of the claimed invention would be materially affected by the method of Mirkin. As noted above, if applicant contends that additional steps in Mirkin are excluded by the recitation of "consisting essentially of," *applicant has the burden* of showing that the introduction of additional steps would materially change the characteristics of applicant's invention.

With respect to independent claim 217, the patterning compound itself forms the meniscus [Fig. 2] and, consequently, reads on the claimed "transport medium."

With respect to dependent claims 31 – 34, 119, 188, and 212, Mirkin teaches that the pattern is either a dot or a line of water, which anticipates applicant's claimed "chemical molecule," with dimensions on the order of a few micrometers [Figures].

With respect to dependent claims 37 and 205 as noted above, Mirkin teaches an AFM tip [p. 6864, c. 2, top].

With respect to dependent claims 89, 90, 158, and 159, Mirkin teaches the deposition of stable patterns on the nanometer scale carried from the tip to the substrate by capillary action [p. 6866, c. 1, penultimate ¶; p. 6867, c. 1, last ¶ and c. 2, ll. 9 – 12].

With respect to dependent claims 91 – 93, 97, 160, 161, 162, and 166, Mirkin teaches the deposition by dotting or by scanning [Figures and p. 6867, c. 1].

With respect to dependent claims 94, 163, absent evidence to the contrary, based on the illustrations of Mirkin, the water flows evenly in all directions from the tip to the substrate surface [Fig. 2].

With respect to dependent claims 95, 96, 148, 164, 165, 206 Mirkin teaches that patterning is carried out in an isolation chamber of controlled relative humidity [p. 6864, penultimate ¶].

With respect to dependent claims 100, 170 Mirkin illustrates a dot of uniform appearance [Fig. 1].

With respect to dependent claims 103 – 108, 172 – 177 Mirkin teaches various patterns of lines of with widths on the nanometer scale [Fig. 5].

With respect to dependent claims 112, 181 Mirkin teaches repeated scanning [p. 6867].

With respect to dependent claims 113, 182 Mirkin teaches imaging by lateral force microscopic (LFM) imaging [p. 6864].

With respect to dependent claim 116, 117, 185, 186, 211 insofar as the patterning compound is adhered to a high-energy surface and is not easily removed (for example, by repeated scanning) and, insofar as Mirkin also teaches that the surface may be hydrophilic and a hydrophilic surface inherently has an affinity for water, it is the examiner's position that Mirkin anticipates the molecule's of the patterning compound having a chemical affinity for and is chemisorbed on, the substrate.

With respect to dependent claims 143 and 145, Mirkin teaches controlling these factors to improve resolution [pp. 6867 – 6868].

Claim Rejections - 35 USC § 103

25. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

26. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

27. **Claims 13, 14, 114, 136, 137, 143 – 147, 155, and 213 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jaschke et al. (*Langmuir* 1995, 11, 1061 – 1064).**

The teaching of Jaschke is detailed above. Jaschke does not explicitly teach that a second pattern is produced by a second patterning compound. Jaschke does suggest that different patterns may be produced with different patterning compounds [p. 1062, c. 2]. In light of this teaching, it would have been obvious to one of ordinary skill in the art to modify the method of Jaschke so as to deposit several patterns of either the same or different patterning compounds, with the expectation of depositing a desired pattern on the substrate. With specific respect to

claim 13, the steps of this claim would have been readily obvious to one of ordinary skill in the art as a means avoiding contamination while switching patterning compounds.

With respect to claim 114, Jaschke does not teach the dot spacing claimed. Such spacing is a result-effective variable, effecting the properties of the finished film, such as continuity. Absent a showing of unexpected results demonstrating the criticality of the claimed dot spacing, it would have been obvious to one of ordinary skill in the art to modify the method of Jaschke so as to optimize such a result-effective variable by routine experimentation [see MPEP § 2144.05(II)].

With respect to claims 143 – 147, these are all well-known means of improving the resolution of an AFM tip and, consequently, would have been readily obvious to one of ordinary skill in the art.

28. Claims 15 and 17 – 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jaschke et al. (*Langmuir* 1995, 11, 1061 – 1064), as applied to claim 13 above, in further view of Okada et al. (US 5,227,626 A).

The teaching of Jaschke is detailed above. As noted, it would have been obvious to one of ordinary skill in the art to modify the method of Jaschke so as to deposit several patterns of either the same or different patterning compounds, with the expectation of depositing a desired pattern on the substrate. Jaschke does not teach the plural tip mechanism recited in these claims. Okada teaches just such a mechanism for controlling several SXM tips in the same or different patterns [abstract; c. 2, ll. 20 – 30; c. 5, ll. 30 – 33 and ll. 53 – 56; c. 6, ll. 50 – 51; and cc. 6 – 9]. It would have been obvious to modify the method of Jaschke so as to deposit the same or different patterns utilizing the mechanism of Okada. One of ordinary skill would have been

motivated to do so by the desire and expectation of saving time by controlling multiple tips simultaneously.

29. **Claims 148 – 152, 156, 206 – 210, and 214 are rejected under 35 U.S.C. 103(a) as being unpatentable over Jaschke et al. (*Langmuir* 1995, 11, 1061 – 1064), as applied to claims 88, 157, and 213, respectively, in further view of by Mirkin et al. (*Langmuir* 1997, 13, 6864 – 6868).**

The teaching of Jaschke is detailed above. This reference does not teach that the patterning is carried-out in an enclosure and at a controlled relative humidity. Mirkin teaches that humidity is a factor well-known to affect the function of an AFM tip and carries out deposition from an AFM tip in an enclosure with a controlled relative humidity [p. 6864, cc. 1 – 2]. Consequently, it would have been obvious to one of ordinary skill in the art to modify the method of Jaschke so as to conduct the deposition in an enclosure having a controlled relative humidity so as to control the friction of the tip during deposition.

Allowable Subject Matter

30. Claims 2 – 9, 16, 25 – 30, 35, 124 – 132, 135, 138, 141, 142, and 193 – 201 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

31. The following is a statement of reasons for the indication of allowable subject matter: With respect to claims 2 – 4, Jaschke explicitly teaches away from a gold substrate [p. 1062, c. 2, ¶ 3]. With respect to claims 5 and 6, the prior art neither teaches nor suggests the substrates claimed. With respect to claims 7 – 9, the prior art neither teaches nor suggests the substrates or patterning compounds that are proteins, peptides, or silanes. With respect to claims 16 and 138,

the prior art neither teaches nor suggests that the patterning compound acts as an etch resist or that the method further comprises chemical etching. With respect to claims 25 and 26, the prior art neither teaches nor suggests deposition of a patterning compound atop a different, previously-deposited patterning compound. With respect to claims 27 – 30, the prior art neither teaches nor suggests enhancing the adhesion of the patterning compound to the tip. With respect to claims 124 – 132, the prior art neither teaches nor suggests the patterning compounds recited in these claims. With respect to claim 135, the prior art neither teaches nor suggests using the method to selectively place different types of molecules at specific sites within a particular type of nanostructure. With respect to claim 141, the prior art neither teaches nor suggests that the method is used for gene detection. With respect to claim 142, the prior art neither teaches nor reasonably suggests the substrate claimed. With respect to claims 193 – 201, the prior art neither teaches nor suggests the patterning compounds recited in these claims.

Double Patenting

32. A rejection based on double patenting of the "same invention" type finds its support in the language of 35 U.S.C. 101 which states that "whoever invents or discovers any new and useful process ... may obtain a patent therefor ..." (Emphasis added). Thus, the term "same invention," in this context, means an invention drawn to identical subject matter. See *Miller v. Eagle Mfg. Co.*, 151 U.S. 186 (1894); *In re Ockert*, 245 F.2d 467, 114 USPQ 330 (CCPA 1957); and *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970).

A statutory type (35 U.S.C. 101) double patenting rejection can be overcome by canceling or amending the conflicting claims so they are no longer coextensive in scope. The

filing of a terminal disclaimer cannot overcome a double patenting rejection based upon 35 U.S.C. 101.

33. Claim 37 is rejected under 35 U.S.C. 101 as reciting the same invention as that claimed in claims 1 – 7 of U.S. Patent No. 6,635,311 B1.

34. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. See *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and, *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent is shown to be commonly owned with this application. See 37 CFR 1.130(b).

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

35. Claims 97, 103, 110, 116, 117, 120, 121, 166, 172, 179, 185, 186, 189, 190, 216, and 218 are rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over claims 1 - 20 of U.S. Patent No. 6,635,311 B1.

Although the conflicting claims are not identical, they are not patentably distinct from each other because the subject matter of the instant claims is broader than, and inclusive of, the subject matter of the patented claims. In this respect, the patented claims anticipate the instant claims: in performing the method of the patented claims one, necessarily, must perform the method of the instant claims. Anticipation is the epitome of obviousness.

Conclusion

36. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Encyclopedia of Materials Characterization: Surfaces, Interfaces, Thin Films, teaches that the terms “atomic force microscope” (AFM) and “scanning force microscope” (SFM) are synonymous [p. 703]. This reference further teaches that typical functioning of the tips includes raster scanning.

Hawley's Condensed Chemical Dictionary, 12th Edition teaches that mica is a solid and provides definitions of the terms “chemisorption” and “hydrophilic” [pp. 783 – 784, 254, and 618, respectively].

US 6,403,382 B1 teaches that a “lattice parameter” is an inter-molecular distance [c. 1., ll. 30 – 39].

JP 10-267824 A teaches that *n*-ODT forms a self-assembled monolayer on a mica substrate [abstract], as asserted by Jaschke.

Binning et al. (US 4,539,089 A), Tada et al. (US 5,935,454 A), and Kolb et al. (*Science*; Feb 21, 1997; 275, 1097) are cited as representative of the state of the art.

Art Unit: 1762

37. Any inquiry concerning this communication or earlier communications from the examiner should be directed to William P. Fletcher III whose telephone number is (703) 308-7956. The examiner can normally be reached on Monday through Friday, 9 AM to 5 PM.

NOTE: Beginning 12/10/03, the examiner can be reached at (571) 272-1419.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Shrive P. Beck can be reached on (703) 308-2333. The fax phone number for the organization where this application or proceeding is assigned is (703) 872-9310.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0661.

WPF 11/20/03

William P. Fletcher III
Examiner
Art Unit 1762

**MICHAEL BARR
PRIMARY EXAMINER**

